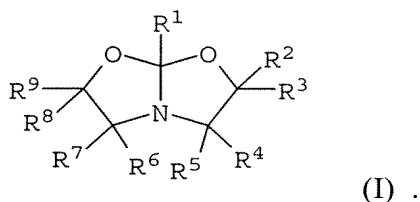


### REMARKS

Claims 1-10, 12, and 13 are pending in the application. Claims 9, 10, 12, and 13 have been withdrawn from consideration as being directed to a non-elected invention.

The present claims are directed to a process for postcrosslinking a water-absorbing polymer by applying a bicyclic amide acetal (I) having a structure



In contrast to prior compounds used to postcrosslink a water-absorbing resin, the claimed bicyclic amide acetals are relatively less reactive, but still capable of reacting with carboxyl groups (specification, page 2, lines 21-23). Compound (I) also has a substantially reduced toxicity compared to other postcrosslinking compounds. Compound (I) preferably is dissolved in and applied from an inert solvent, such as alcohols, diols, and water as in Examples 2-36.

Claims 1-8 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims 3 and 24 of copending Application No. 11/630,949 ('949 application). Applicants traverse this rejection.

The present claims are directed to postcrosslinking of a water-absorbing polymers using a bicyclic amide acetal of formula (I). The claims of the '949 application are directed to postcrosslinking of a water-absorbing polymer using a cyclic carbonate or cyclic urea. This reaction product, e.g., an N-(hydroxyethyl) oxazolidin-2-one, has a substantially different structure from a claimed bicyclic amide acetal. The reaction disclosed in the '949 application cannot form a claimed bicyclic amide acetal. To prepare a bicyclic amide acetal recited in the claims, dimethylformamide dimethyl acetal must be used (specification page 3, line 35 to page 4, line 3). Reacting diethanolamine with dimethylformamide dimethyl acetal forms 1-aza-4,6-dioxabicyclo[3.3.0]octane, the bicyclic amide acetal of Examples 6 to 9 of the present invention. On its face, it is submitted that the present claims and claims 3 and 24

of the '949 application are independent and distinct. Nevertheless, because this provisional double patenting rejection is not the only remaining rejection in the present application, it would be premature to address this rejection any further at this time. Applicants will consider a response to overcome this provisional obviousness-type double patenting rejection in view of copending Application No. 11/630,949 should it become necessary.

Claims 1-8 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims 1, 11, and 12 of copending Application No. 10/588,671 ('671 application). Applicants traverse this rejection.

The present claims are directed to postcrosslinking of a water-absorbing polymer using a bicyclic amide acetal of formula (I). The claims of the '671 application are directed to postcrosslinking water-absorbing polymers using a surface postcrosslinker and a polyvalent cation in claimed relative amounts. The '671 application claims do not recite *any specific* surface postcrosslinker. On its face, it is submitted that the present claims and the claims of the '671 application are independent and distinct. In addition, note that the '671 application was filed *after* the present application, and the present invention merely *disclosed* bicyclic amide acetals as a potential surface postcrosslinker because of the teachings of the present invention. The scope of the claims in the '671 patent is completely different from the present claims. It is also suggested that the examiner reconsiders the cited *In re Vogel* decision wherein the disclosure *may not* be used as prior art in an obviousness-type patenting rejection. Nevertheless, because this provisional double patenting rejection is not the only remaining rejection in the present application, it would be premature to address this rejection any further at this time. Applicants will consider a response to overcome this provisional obvious-type double patenting rejection in view of copending Application No. 10/588,671 should it become necessary.

Claims 1-8 stand rejected as not being patentably distinct from claims 3 and 24 of the commonly-assigned '949 application, i.e., U.S. Patent Publication 2008/0171837 ('837 publication), and as not being patentably distinct from claims 1, 11, and 12 of the commonly assigned '671 application, i.e., U.S. Patent Publication 2007/0161759 ('759 publication). It is submitted that these rejections should be withdrawn because the presently

claimed invention and the inventions of the '949 and '671 applications were commonly-owned at the time the invention in the present application was made.

In particular, the '949 application, the '671 application, and the current application all are owned by BASF AG. The '949 application was assigned to BASF AG by virtue of an assignment recorded in the U.S. Patent Office at Reel/Frame 19968/0348 on October 12, 2007. The '671 application was assigned to BASF AG by virtue of an assignment recorded in the U.S. Patent Office at Reel/Frame 19242/0036 on April 30, 2007. The current application was assigned to BASF AG by virtue of an assignment recorded in the U.S. Patent Office at Reel/Frame 18101/0010 on July 13, 2006. These assignments are evidence that the subject matter disclosed in the '949 and '671 applications and the subject matter recited in the pending claims of the current application were, at the time the claimed invention was made, owned by the same person or subject to an obligation of assignment to the same person. Consequently, the '949 and '671 applications cannot be considered as prior art in support of a 35 U.S.C. §103 rejection of the pending claims (35 U.S.C. §103(c)(1)), and a rejection of pending claims 1-8 over the '949 and '671 applications is precluded.

Claim 4 stands objected to because of improper grammar. Applicants traverse this objection. Applicants, however, have amended claim 4 to clarify that the polymer can be (a) or (b), as recited in the claim. In view of the amendment to claim 4, it is submitted that this objection should be withdrawn.

Claims 1-8 stand rejected under 35 U.S.C. §103 as being obvious over Engelhardt et al. U.S. Patent No. 6,414,214 ('214) in view of Goel et al. U.S. Patent No. 4,539,376 ('376). The basis of the rejection is that, because the '214 patent discloses treating a crosslinked polymer with 2-oxazolidinone and the '376 discloses treating a maleic anhydride polymer with a bicyclic amide acetal, that it would have been obvious to post-crosslink a water-absorbent polymer with a bicyclic amide acetal. Applicants traverse this rejection.

A determination that a claimed invention would have been obvious under §103(a) is a legal conclusion involving four factual inquiries: (1) the scope and content of the prior art; (2) the differences between the claimed invention and the prior art; (3) the level of

ordinary skill in the pertinent art; and (4) secondary considerations, if any, of non-obviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). The Patent Office must clearly articulate facts and reasons why the claimed invention "as a whole" would have been obvious to a hypothetical person having ordinary skill in the art at least as of the claimed invention's effective filing date. *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007) (citing with approval *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) ("[R]jections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.")); see also MPEP §2143 ("The key to supporting any rejection under 35 U.S.C. §103 is the clear articulation of reason(s) why the claimed invention would have been obvious.").

To reach a proper determination under 35 U.S.C. §103(a), the examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all factual information, the examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of applicants' disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search, and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon applicants' disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art. MPEP §2142.

Furthermore, to establish a *prima facie* case of obviousness, the examiner must satisfy three requirements. First, as the U.S. Supreme Court recently held in *KSR International Co. v. Teleflex Inc. et al.*, 127 S.Ct. 1727 (2007), "a court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions. ...it [may] be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was *an apparent reason* to combine the known

elements in the fashion claimed by the patent at issue. ...it can be important to *identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements* in the way the claimed new invention does... because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known." (emphasis added, *KSR, supra*). Second, the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *Amgen Inc. v. Chugai Pharm. Co.*, 18 USPQ2d 1016, 1023 (Fed. Cir. 1991). Lastly, the prior art references must teach or suggest all the limitations of the claims. *In re Wilson*, 165 USPQ 494, 496 (C.C.P.A. 1970).

As articulated by the Court of Appeals for the Federal Circuit in *Ortho-McNeil Pharmaceutical Inc. v. Mylan Laboratories Inc.*, 86 USPQ 2d, 1196, 1201-2 (Fed. Cir. 2008):

"As this court has explained, however, a flexible TSM test remains the primary guarantee against a non-statutory hindsight analysis such as occurred in this case. *In re Translogic Tech., Inc.* 504 F.3d 1249, 1257 [84 USPQ 2d 1929] (Fed. Cir. 2007) ("[A]s the Supreme Court suggests, a flexible approach to the TSM test prevents hindsight and focuses on evidence before the time of invention.

A number of rationales that may be used to support a conclusion of obviousness have been identified. See *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1739-40 (2007). These rationales are described at MPEP §2143 (8<sup>th</sup> Ed., Rev. 6, Sept. 2007).

The rationale relied upon by the examiner in this rejection apparently is as follows:

"B. Simple Substitution of One Known Element for Another To Obtain Predictable Results

To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Office personnel must then articulate the following:

(1) a finding that the prior art contained a device (method, product, etc.) which differed from the claimed device

by the substitution of some components (step, element, etc.) with other components;

(2) a finding that the substituted components and their functions were known in the art;

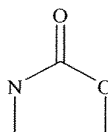
(3) a finding that one of ordinary skill in the art could have substituted one known element for another, and the results of the substitution would have been predictable; and

(4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

The rationale to support a conclusion that the claim would have been obvious *is that the substitution of one known element for another would have yielded predictable results* to one of ordinary skill in the art at the time of the invention. *If any of these findings cannot be made, then this rationale cannot be used* to support a conclusion that the claim would have been obvious to one of ordinary skill in the art." (Federal Register, Vol. 72, No. 195, page 57530, Oct. 10, 2007, emphasis added)

The '214 patent discloses hydrogel-forming polymers prepared, for example, by polymerizing acrylic acid. Although the polymers of the '214 patent can be prepared from an anhydride ('214 patent, column 3, line 47), anhydride groups *are* not present in the final polymer. During the polymerization, all anhydride groups are hydrolyzed to carboxyl groups. See Examples of the '214 patent wherein the polymers are prepared from an *aqueous* monomer solution, which would hydrolyze any anhydride groups that are present.

As is standard in the art, the '214 patent discloses surface postcrosslinking of the polymer gels at column 8, lines 10-51. The '214 discloses numerous compounds useful as surface crosslinkers, e.g., compounds typically contain hydroxy (-OH), amino(-NH<sub>2</sub>), blocked isocyanate (-NCO), and/or epoxy  $\left( \begin{array}{c} \text{O} \\ \diagup \quad \diagdown \\ \text{CH}_2 \quad \text{CH}_2 \end{array} \right)$  groups, carbonic acid derivatives, and N-methylol compounds. One known postcrosslinker is 2-oxazolidinone having a structure:



2-Oxazolidinone contains a carbamate moiety (-N-C(=O)-O-) that reacts with carboxyl groups of the hydrogel-forming polymer to surface crosslink the polymer particles. 2-Oxazolidinone is a monocyclic compound in no way related in structure to a claimed bicyclic amide acetal and has different functional groups.

The '214 patent further *specifically* discloses a preference for a surface postcrosslinker of *high* reactivity in order to achieve the benefits of the '214 patent, i.e., increased mechanical stability of polymer particles. As stated in the '214 patent at column 8, line 64 through column 9, line 13:

"The surface postcrosslinking heat treatment step provides hydrogel-forming polymers having a very low residual moisture content, typically of less than 1% by weight, frequently even of less than 0.5% by weight. It is believed that a low residual moisture content increases the brittleness of hydrogel-forming polymers, so that these products have only low mechanical stability.

According to the invention, increasing the residual moisture content to at least 3% by weight, preferably at least 4% by weight, more preferably to at least 5% by weight, increases the mechanical stability of these products considerably.

The use of surface postcrosslinkers of higher reactivity, for example ethylene glycol diglycidyl ether and its mixtures, makes it possible, through gentler temperatures, to terminate the reaction directly on obtaining a residual moisture content of at least 3% by weight."

The '214 patent therefore leads persons skilled in the art *away* from surface postcrosslinking using a compound of *lower* reactivity, such as 2-oxazolidinone.

It is well known in the art to use reactive surface postcrosslinkers in order to facilitate the surface postcrosslinking step. Reactive surface crosslinkers reduce energy

requirements (i.e., require lower elevated temperatures) in the surface postcrosslinking step and maintain the esthetics of the polymer particles because surface postcrosslinking at a high temperature leads to discoloration of the polymer particle. Therefore, the art searches for and uses a surface postcrosslinker of relatively high reactivity to save energy costs and maintain polymer particle esthetics, and, in the specific case of the cited '214 patent, to provide polymer particles of high mechanical stability.

The '376 patent is directed to crosslinking maleic anhydride polymers using a bicyclic amide acetal. The bicyclic amide acetal of the '376 patent is used to provide crosslinks between linear maleic anhydride polymers. In the '376 patent, a previously prepared maleic anhydride homopolymer or copolymer is crosslinked *via* the pendant anhydride moiety of the maleic anhydride using a bicyclic amide acetal. See '376 patent, column 1, lines 38-41. The '376 patent is neither directed to water-absorbing polymers nor to surface postcrosslinking. Surface postcrosslinking is substantially different from the crosslinking disclosed in the '376 patent.

In the method of the '376 patent, the highly reactive anhydride group of maleic anhydride reacts with the relatively low reacting bicyclic amide acetal. Further, the crosslinking reaction of the '376 patent is performed in an inert solvent (e.g., toluene or acetone in Examples 1-4 of the '376) or without solvent (Example 5) in order to preserve the reactive anhydride groups of the polymer for reaction with the bicyclic amide acetal. The presence of water or an alcohol would destroy the anhydride groups.

In the surface crosslinking of a water-absorbing polymer, *no* reactive anhydride groups are present. For example, see present claim 4 wherein the polymer to be crosslinked contained acrylic acid or acrylic esters. Carboxyl and ester groups are much less reactive than acid anhydrides, so the facile crosslinking reaction disclosed in the '376 patent for maleic anhydride would require much harsher conditions for a carboxylic acid or ester.

In short, the crosslinking reaction of the '376 patent between the maleic anhydride units and bicyclic amide acetal is as facilitated by the high reactivity of the anhydride groups, which permit a reaction with the bicyclic amide acetal of relatively low



reactivity, and wherein the inert solvent maintains the anhydride moiety so it is available for reaction.

A person skilled in the art would have had no apparent reason or incentive to substitute the bicyclic amide acetal of the '376 patent for the 2-oxazolidinone of the '214 patent in a surface crosslinking step involving carboxyl groups. Such a substitution, after reading the '214 and '376 patents, would not have provided a reasonable expectation of successfully surface crosslinking water-absorbing particles.

The '214 patent teaches 2-oxazolidinone as a surface postcrosslinker and specifically discloses that the *more* reactive the surface postcrosslinkers provide the improved water-absorbing polymer particles. Therefore, the '214 provides no motivation or incentive to use bicyclic amide acetals of relatively low reactivity, as claimed, as a surface crosslinker.

The '376 patent does not overcome this deficiency. The '376 patent crosslinks a polymer via highly reactive anhydride groups. These groups are preserved for crosslinking by a bicyclic amide acetal by conducting the reaction in an inert solvent or in the absence of a solvent. The highly reactive anhydride groups are preserved to allow a reaction with the bicyclic amide acetal of relatively low reactivity to proceed. Water-absorbing resins do *not* contain anhydride groups (i.e., maleic *anhydride* polymers are not water-absorbing), but rather contain substantially less reactive carboxyl groups.

Overall, the combination of references teaches surface crosslinking using a highly reactive surface crosslinkers with a slow reacting carboxyl group ('214 patent) and crosslinking using a low reactivity bicyclic amide acetal to crosslink a highly reactive anhydride-containing polymer ('376 patent). In stark contrast the present claims recite surface postcrosslinking of a low reactivity carboxyl group with a relatively low reactivity bicyclic amide acetal.

This claimed surface crosslinking process is neither taught nor considered by the cited references, alone or in combination, which in fact discourages such a process. A person skilled in the art simply would have had no reasonable expectation of successfully

surface postcrosslinking a water-absorbing polymer using a bicyclic amide acetal after considering a combination of the '214 and '376 patents.

In addition, it would not have been predicted that a relatively inert bicyclic amide acetal, at a low weight percent, would successfully surface crosslink water-absorbing polymers, as set forth in Examples 2-36 of the specification.

Accordingly, it is submitted that the rejection of claims 1-8 as being obvious under 35 U.S.C. §103 over a combination of the '214 and '376 patent is in error and should be withdrawn.


In summary, it is submitted that all pending claims are in a form and scope for allowance. An early and favorable action on the merits is respectfully requested.

Should the examiner wish to discuss the foregoing, or any matter of form in an effort to advance this application toward allowance, the examiner is urged to telephone the undersigned at the indicated number.

Dated: August 21, 2009

Respectfully submitted,

By

  
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